Quiz: Engineering

Read each question. Circle the letter of the correct answer.

1. Which activity would more likely be performed by engineers than by scientists?

A. explaining how forces impact matter

B. collecting data and developing theories

C. applying scientific principles to design a structure

D. investigating a phenomenon to understand how it works

2. Which of these describes a risk of an engineering design?

A. a disadvantage of a solution

B. a favorable effect of a solution

C. an advantage that may happen

D. a cost that may or may not happen

3. A product designer is deciding whether to use wood or plastic for a knife handle. Which of these describes a tradeoff involved in this decision?

A. Plastic is the best solution because it is more durable.

B. Wood is the best solution because it is easier to hold and looks better.

C. Wood is good for knives that are used to cut with precision or are given as gifts.

D. Plastic is good for knives that are used a lot even though it can sometimes be slippery.

4. Which type of stress on rock creates a strike-slip fault?

A. shear

B. reverse

C. tension

D. compression

5. An engineer is working on two different projects. In the first project, cost is a criterion. In the second project, cost is a constraint. Which statement would best help to explain this?

A. In the first project, the cost of the project is minimized, while in the second project, the cost is maximized.

B. In the first project, the cost of the project is maximized, while in the second project, the cost is minimized.

C. In the first project, cost is a limitation on the design, while in the second project, low cost is a desirable feature.

D. In the first project, low cost is a desirable feature, while in the second project, low cost is a limitation on the design.

6. Which of these best describes a cost-benefit analysis?

A. an analysis of the environmental cost of a solution

B. an analysis of the cost of repeating the design process

C. an analysis of the pros and cons of a proposed solution

D. an analysis of the likelihood of finding an optimal solution

7. What is a load on an engineering structure?

A. the net force on the walls of a structure

B. the external forces due to the environment

C. the separate forces that act on each section of a structure

D. the internal forces between neighboring materials in a structure

8. Which of these best describes the way in which civil engineers balance forces in a structure?

A. by making sure the net force on each section is zero

B. by making sure the stress and load on each section are equal

C. by designing support structures for each wall with compression stress

D. by designing layers that transfer the normal force from the walls to the ground

9. Which step is used by engineers to optimize a solution?

A. repeating the design process and making changes

B. identifying the benefits of the first design that works

C. using any material that is easily available to reduce cost

D. identifying and managing risks after the design has been built

10. A city wants to hire engineers to study the rock and soil systems that will support a civil engineering project. Which type of engineers should the city hire to do this?

A. material engineers

B. hydraulic engineers

C. geotechnical engineers

D. architectural engineers

Read each statement. Write your answer on the lines.

11. A group of engineers is tasked with designing a new windshield wiper that is easily replaceable and cheaper than previous models. Identify at least one criterion and one constraint for the new windshield wiper design.

12. After creating a decision matrix for two types of materials used to design a safety belt, an engineer assigns a weight of 4 to nylon for thickness and a weight of 5 to polyester for thickness. The engineer also assigns a weight of 4 to nylon for strength and a weight of 3 to polyester for strength. Polyester is more expensive than nylon. Describe which material would be preferable to use for the safety belt if cost is prioritized as a criterion.

13. A swing is made of a metal frame and two straps that hold the swing seat. A person sits on the swing seat. Identify the stress that is felt by the metal frame and the stress that is felt by the straps once the person sits on the swing.

14. The bottom panel of an elevator should be able to provide a reaction force of at least 3,000 N in order to remain stable. The area of the panel is 1.5 m^2. Calculate the stress on the bottom panel of the elevator.

15. A truss bridge has an open framework of triangles and can be used in conditions where there is a large load and other environmental forces. Explain how the structure of a truss bridge supports itself when the load bends the bridge.